Programmability Keeps Vehicles Up to Speed with Fast-Paced Electronics Advances

Conflicting Development Cycles

Traditionally driven by mass standardization, automotive electronics have been unremittingly characterized by long product life cycles and low costs. But today, that model has become obsolete and exactly the opposite condition has arisen—while car makers must still design systems that support long life cycles, new electronics must be able to flexibly adapt to rapid and virtually unpredictable evolutions in capabilities.

Automotive vehicle design rightly involves extensive research and development, with stringent safety demands and rigid product standards that apply to every part of the vehicle. However, because cars and trucks take so many years to go from concept to production, automotive manufacturers are perpetually behind the innovation curve of today's consumer electronics. A new vehicle conceived today might not reach a consumer owner for another four to five years and many consumers will keep that vehicle on the road for as many as 10 years after that. Even the automotive design hubs like the United States, Japan, Korea, and Germany are today making technology and component choices for automobiles that will not hit the road until 2009 or 2010. With electronics innovation cycles measured in terms of months, today's electronics will be obsolete by the time a car reaches its first owner.

Rapidly Advancing Features and Functions

Only a short time ago, the entertainment hub of the car was the AM radio. Over time, advances brought built-in dashboard players for eight-track tapes and cassette tapes, but by the time carmakers made cassette tape decks standard equipment, the music industry was already converting its customer base to compact disks. And now that CD players are virtually universal in vehicles (it took 10 years for the auto industry to achieve 98% penetration for CD players), drivers are demanding a way to directly connect their MP3 players into car audio systems. The wildly popular iPod had already been on the market for two years by the time Honda started making the Element, one of the first cars with an auxiliary audio source input jack. But consumers already want to go beyond that to control their MP3 players through the in-dash audio gear.

Recent advances have also brought new connectivity technologies to the vehicle. Like everything else in the consumer electronics arena —computers, the digital home electronics, portable entertainment devices—the car has become a converged application "device" that is dependent on the aggregation of audio, video, and data to provide entertainment, information, and safety to drivers. Today's in-car infotainment and telematics centers are expanding well beyond audio to deliver navigation information, integrated video, and driver-assistance applications. These devices deliver desirable multimedia content to the automobile, but also make the in-car electronics network vulnerable to malicious content embedded in data files. With each vehicle transformed into a richly connected network of processor nodes, customer-requested downloads—Web access, diagnostic uploads, etc.—can turn a once stable vehicle electronics infrastructure into a potentially lethal hotbed of viruses.

How are automotive developers to reconcile two such radically different development curves to ensure that vehicles will provide a fit host for contemporary consumer electronics? The car makers themselves are not likely to diverge from their long-entrenched processes and procedures. In fact, it is the tier-one and tier-two suppliers to the automotive industry who face the challenge of designing electronics platforms that bring the best and most contemporary consumer electronics to the vehicle.

Programmability Keeps Cars Current

A study by the University of Michigan Transportation Research Institute titled "Automotive Industry Trends in Electronics" surveyed 400 auto executives, 71% of whom were CEOs, presidents, vice-presidents, or directors. Survey respondents agreed there is an 85% likelihood that software will command a much higher portion of the value-added chain in the future, and an equally high prospect that the pace of change in automotive electronics will actually become faster going forward. Indeed, the rapid advance in automotive requirements for security and safety, customization, remote diagnostics and maintenance, and other teleservices requires a massive increase in system complexity, with software dominating both hardware and mechanics.

This software-based approach was even advocated by auto executives this year at a panel session held during the Society of Automotive Engineers World Congress in Detroit. Car industry executives speaking on that panel said they believe consumers would be willing to pay for the ability to upgrade the technology in their vehicles in order to work with the latest electronics devices. Ideally, that means cars manufactured in 2008 would be adaptable to work with whatever electronics are state of the art in 2018. But in reality, many automakers are still struggling to make their cars and trucks compatible with what consumers own the day they buy their vehicles.

The only workable solution to the need for such unpredictable elasticity in car electronics functionality is software. By adopting fully programmable product platforms, automotive OEMs can update electronics simultaneous with car production to support the latest available features and functionality. Instead of impossibly guessing at electronics trends, carmakers can futureproof their vehicle electronics—audio, telematics, etc.—by adopting software-programmable processing platforms that allow specific technologies to be implemented when the vehicle comes to market. Upgrades and adaptations are important during the ownership of a car, as

well, since most people buy new portable music players far more often than they trade in their cars. The programmable choice is the only one that minimizes implementation risks while taking into consideration the time-to-market pressures carmakers face. Any other solution essentially paints auto electronics OEMs into a corner.

Analog Devices Powers Software Lifecycle

ADI's continuous investment in processor architectures gives automotive and consumer electronics developers the scalable platforms they need to leverage the power of software against the mismatch between automotive lifecycles and electronics innovation. The Blackfin® processor gives them the price/performance advantage they need to compete. The company's broad processor portfolio includes the new Blackfin ADSP-BF54x family which gives developers high performance, low power architecture, a rich peripheral set, built-in code security, and an extensive set of I/O peripherals all at half the cost of alternatives for automotive applications. The first member of the Blackfin ADSP-BF54x family operates at speeds up to 500 MHz, provides a total of 260 kB on-chip Levels 1 and 2 (L1 and L2) memory, and supports the family's broadest range of peripherals, including up to two controller area network (CAN) 2.0B controllers.

This high level of performance and the CAN interface make the ADSP-BF549 perfectly suited for networked automotive applications, but also importantly, make the processor an ideal long-term platform for futureproofing vehicle designs and anticipating the challenges customers, integrators, and OEMs face in designing the next wave of performance-hungry applications for automotive markets. By designing automotive electronics—media, telematics, control, etc.—around a processor as powerful and flexibly programmable as the ADSP-BF549 engineers can be certain they have minimized the risk of bringing a vehicle to market with obsolete electronics.

ADI Processors Futureproof the Car

Automotive OEMs sit at a crossroads today in deciding how to ensure futureproofed electronics platforms for their carmaker customers, and consumer customers in turn. The only viable choice is a fully programmable processor architecture that brings plenty of performance headroom, a rich ecosystem of development and third-party support, and vendor credibility that stands strong over the long life of the vehicle relationship. Analog Devices brings all these attributes to the automotive market, effectively eliminating the longstanding conflict between automotive and electronics development lifecycles.

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